

**California State Water Resources Control Board**  
**Leaking Underground Fuel Tank (LUFT)**  
**Guidance Manual**



**Update on the LUFT**  
**Manual**  
**2011 SAM Fall Forum**

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# **LUFT Manual Public Comments**

**Public comment period 8/13/2010 – 11/30/2010**

**455 comments received**

**422 received from state and local agencies, 33 from general public and/or industry professionals**

# Who Made Comments?

**27 People Commented**

**18 Regulators**

**8 Consultants**

**1 Laboratory**

# Observations

Tends to focus on cleanup of releases because tank removal is mature

Focus on older releases, not as many new releases occurring

Recognizes natural attenuation

Chapter	Number of Comments
Fate and Transport	57
Risk Evaluation and Risk Management	53
Conceptual Site Model	48
Site Assessment	43
Reports	40
Appendices	35
Overview	30
Laboratory Analysis and Methods	30
Remediation	28
Corrective Action Plan	22
Roles & Responsibilities	18
GeoTracker	16
Work Plans	16
Tank Removal and Closure In Place	14
UST Cleanup Fund	7
Release Response Prioritization	4
Health & Safety	3
Green & Environmentally Responsible Cleanups	3
Initial Reporting and Abatement	3
Glossary	2

# Comments Fall into Three Categories

Organizational/Structural

General/Administrative

Technical



# Organizational/Structural

**“Put the technical section first”**

**“Put the VI Appendix into the body of the Manual”**

**“Move the educational components of the F&T to Appendix”**

**“Add lessons learned to Remediation”**

# General / Administrative

Add acknowledgements page

Add more references

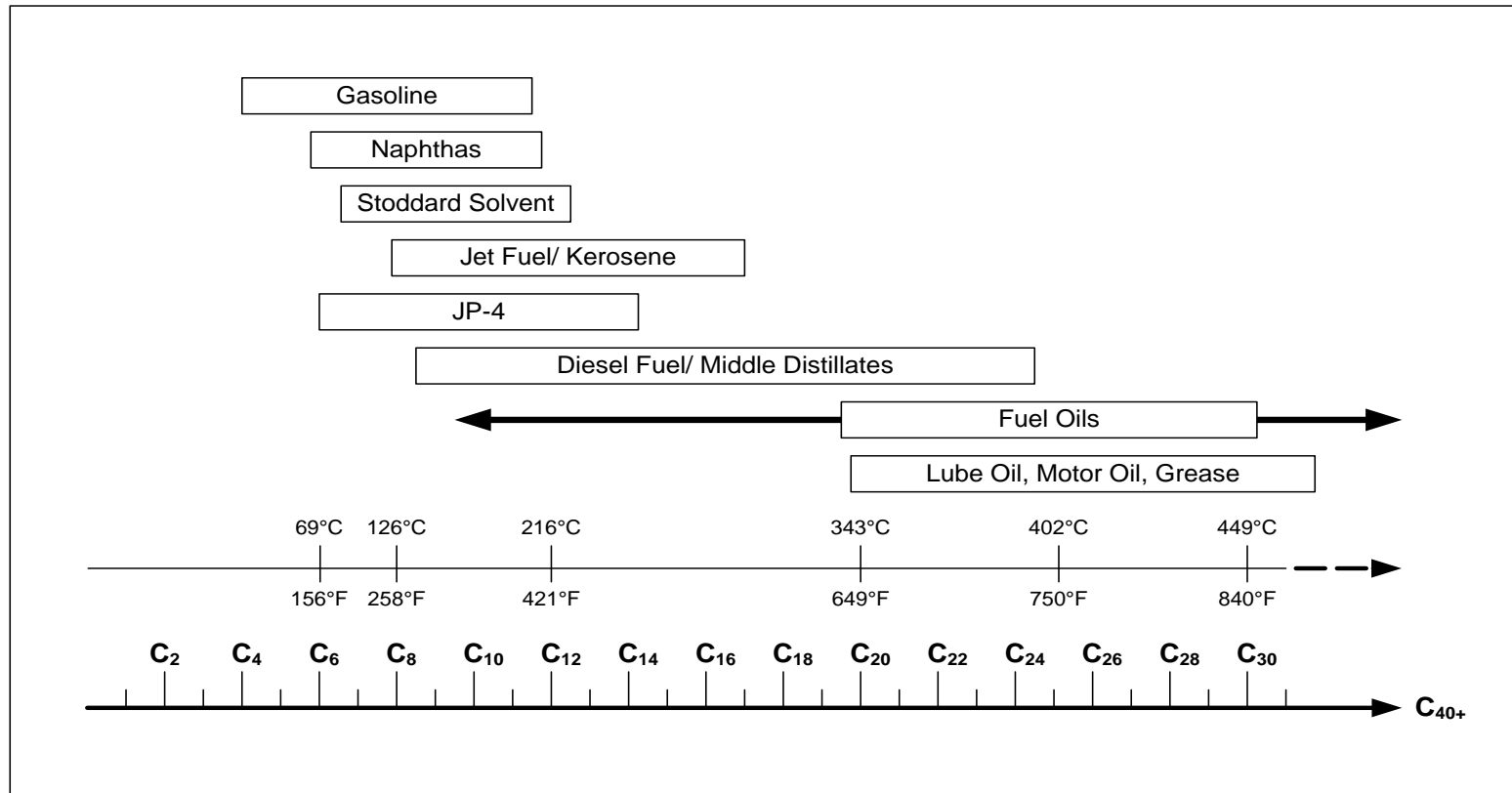
Avoid language like “It has been well established”



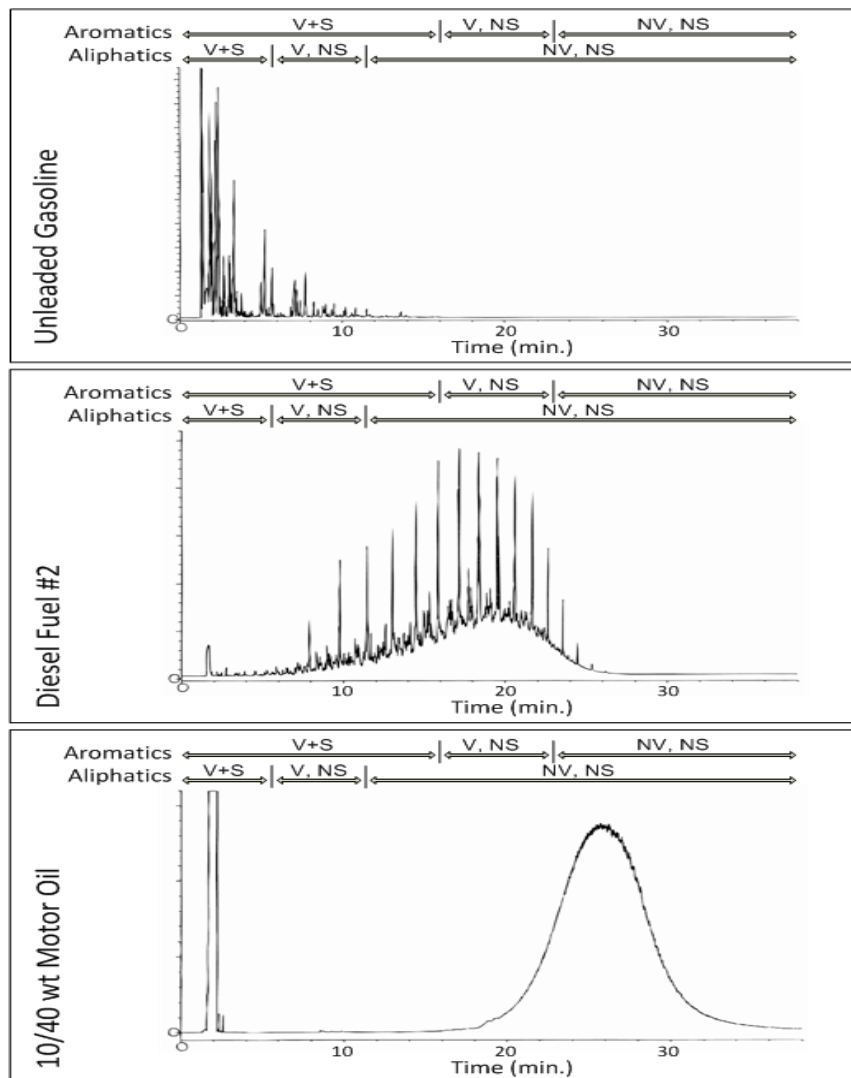
# Fate and Transport

More Chemistry!

Carbon and Boiling Ranges of Petroleum Products



# Fate and Transport



GC-FID chromatograms for gasoline, diesel, and motor oil with volatility and solubility of TPH fractions

Shows the reader the differences between distillates

NV Non-volatile  
 NS Non-soluble  
 S Soluble (Fraction-specific solubility is greater than 1 mg/L)  
 V Volatile (Fraction molecular weight is less than 200 g/mol and Henry's Law Constant is greater than  $10^{-5}$  m<sup>3</sup>-atm/mol)

# Fate and Transport

## Average Composition of Gas and Diesel

Component	Fresh Gasoline (%)	Fresh Diesel (%)
Benzene	2.0 ( <i>max 2.5</i> )	0.03 ( <i>max 0.1</i> )
Toluene	8.1 ( <i>max 12</i> )	0.2 ( <i>max 0.7</i> )
Ethylbenzene	1.7 ( <i>max 2</i> )	0.07 ( <i>max 0.2</i> )
Xylenes	9.0 ( <i>max 11</i> )	0.5 ( <i>max 0.6</i> )
Naphthalene	0.25 ( <i>max 0.36</i> )	0.26 ( <i>max 0.8</i> )
<i>n</i> -hexane	2.4 ( <i>max 3.2</i> )	NM
2-methylnaphthalene	0.18 ( <i>max 0.29</i> )	0.89 ( <i>max 1.5</i> )
HMW PAHs	NM	<0.01
<b>Aliphatics</b>		
C5-C6	21	0
>C6-C8	22	0
>C8-C10	9	2
>C10-C12	3	7
>C12-C16	0	35
>C16-C21	0	34
>C21-C32	0	0
<b>Aromatics</b>		
>C8-C10	13	0.43
>C10-C12	2.3	0.74
>C12-C16	0	8
>C16-C21	0	12
>C21-C32	0	0

# Fate and Transport

## Plume Lengths

Added Buscheck 1996 Reference: 119 sites in NoCal at 91% of the sites, BTEX concentrations were either decreasing or showed no trend. A subset of 62 sites 85% of the benzene plumes were less than 200 feet long

Added Dahlen 2004 Reference: this study found that only 16% of all the wells at 190 sites were hydraulically downgradient of the source zone

# Fate and Transport

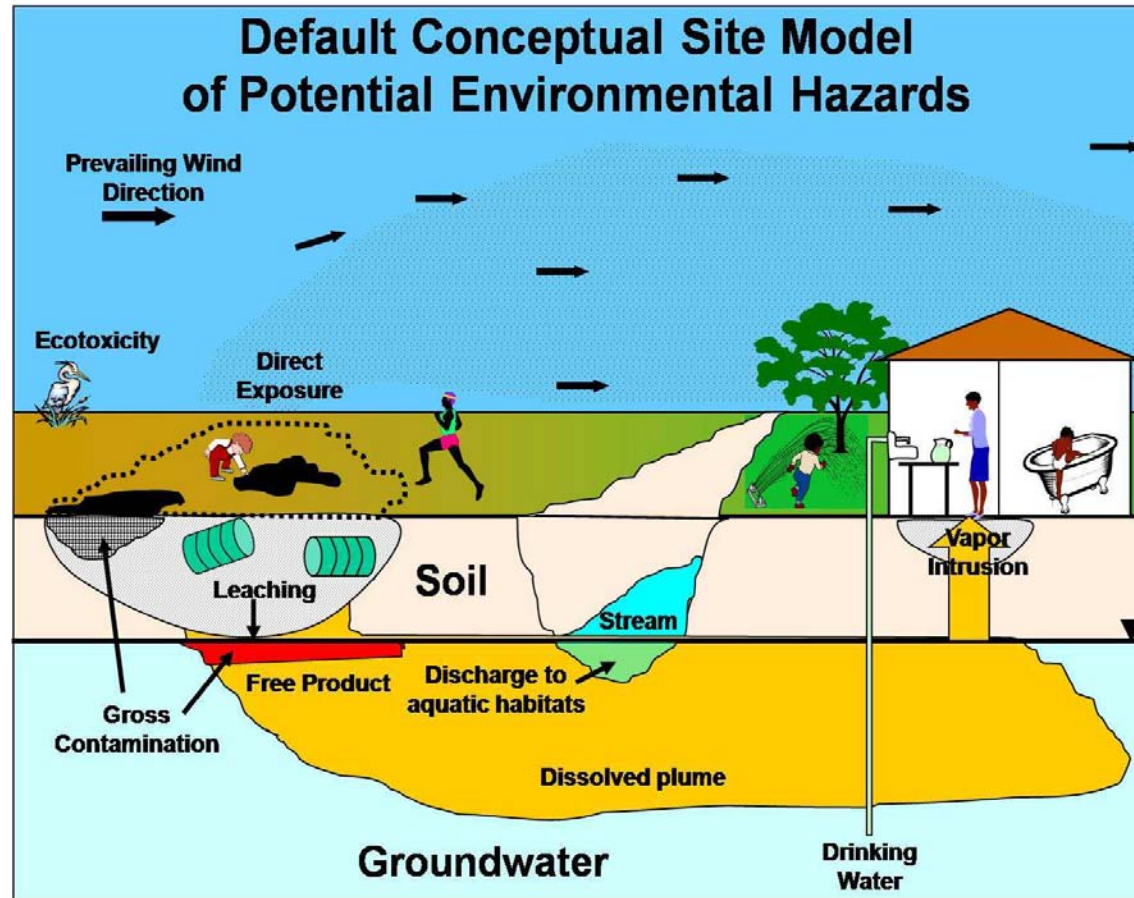
## **Hydraulic Lift Tanks**

October 2010 Manual stated hydraulic lift tanks (HLTs) were permanently exempted by SWRCB “Report on Hydraulic Lift Tanks,” February 1995

Correction: The Regional Water Quality Control Boards retained their authority under Porter-Cologne.

# Conceptual Site Model

Default CSM added from SF RWQCB

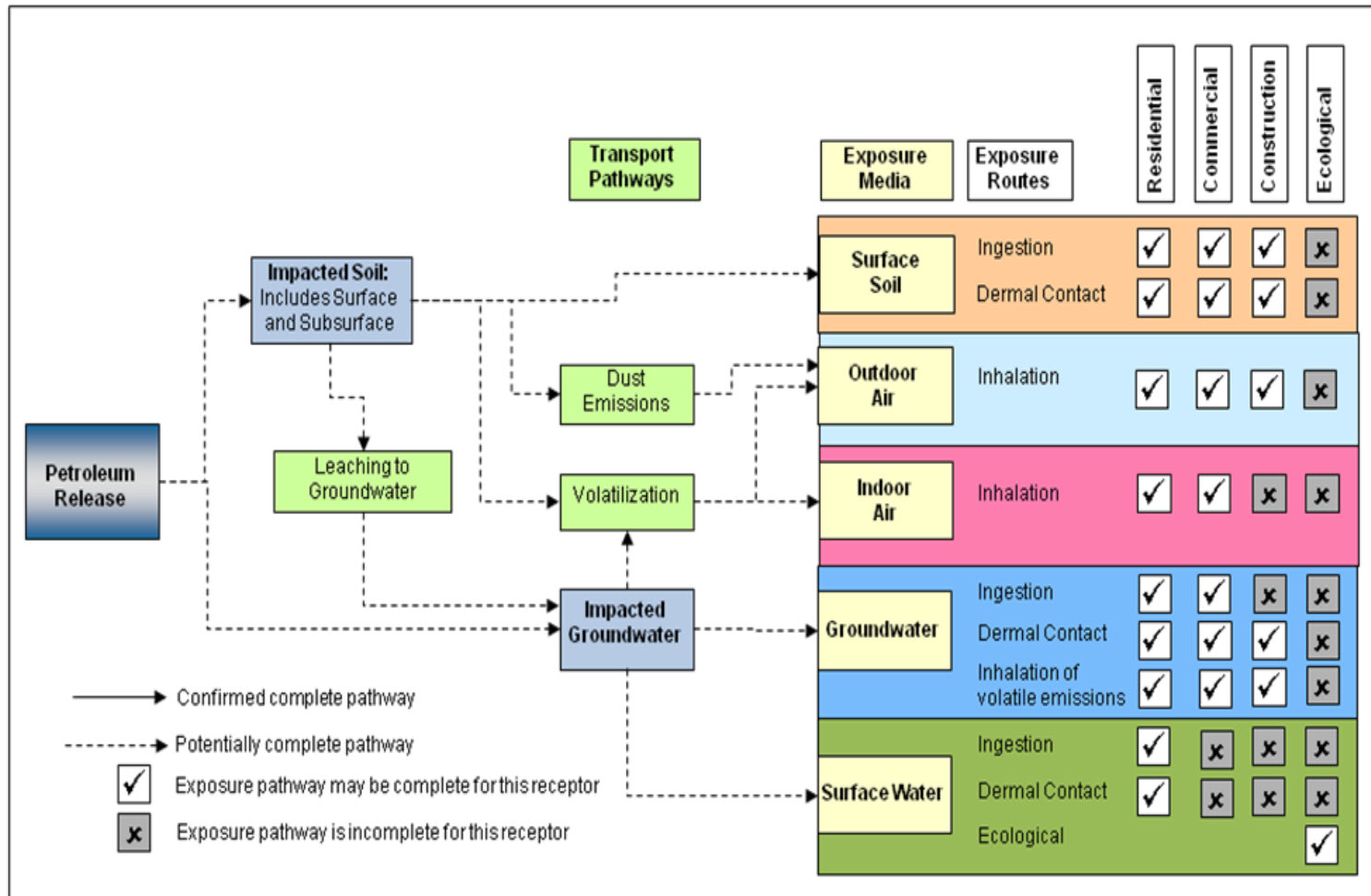


Include Ecological Receptors

Consider future use and adjacent properties

# Conceptual Site Model

New and Improved!



# Site Assessment

## Vapor Intrusion

Improved level of detail on sampling procedures



# Lab Analysis and Methods

## **TPH**

Provide detail on methods and  
recommendations for use

EPA Method	What It Measures	Recommended Use	Comments
<b>1664</b>	n-Hexane Extractable Material (HEM; Oil & Grease), and Silica gel Treated HEM (SGT-HEM; Non-polar Material) by extraction and gravimetry (replaced Methods 413 and 418.1 when Freon was banned)	For materials with boiling points > 85 °C. Provides gross amount of HEM or SGT-HEM. HEM provides no information about molecule class or size. SGT-HEM provides some information about molecule type (non-polar), but not aliphatic/aromatic class, and not size. <b>Not recommended for LUFT sites because it provides so little information and no chromatogram, and no regulatory criteria have been developed for HEM or SGT-HEM.</b>	Included on this table for informational purposes only.
<b>8260B/C GRO</b> (gasoline-range [or purgeable] organics by GC-MS) Recommend C5 to C12 carbon range.	All volatile organics that are purged from a sample and that are detected by a MS within in a certain boiling range (carbon range) and are quantified using a gasoline standard.	Provides gross concentration of purgeable organics within the specified carbon range. Does not provide information about molecular class. Can be used to identify source areas, for mass-fraction calculations of individual compounds, estimating bulk product mobility, or evaluating the extent of organic-impacted soil or groundwater. Can provide TICs because of MS. Chromatogram can be used to identify fuel type/weathering.	Soil or groundwater. Can include non-petroleum purgeable organics (e.g., CVOCs). Products other than (or in addition to) gasoline may be present. Analytical results may not be comparable to EPA Method 8015B GRO.
<b>8015B GRO</b> (gasoline-range [or purgeable] organics by GC-FID) Recommend C5 to C12 carbon range.	All volatile organics that are purged from a sample and that are detected by a FID within in a certain boiling range (carbon range) and are quantified using a gasoline standard.	Provides gross concentration of purgeable organics within the specified carbon range. Does not provide information about molecular class. Can be used to identify source areas, for mass-fraction calculations of individual compounds, estimating bulk product mobility, or evaluating the extent of organic-impacted soil or groundwater. Chromatogram can be used to identify fuel type/weathering.	Soil or groundwater. Can include non-petroleum purgeable organics (e.g., CVOCs). Products other than (or in addition to) gasoline may be present.
<b>8015B DRO/ORO</b> (diesel- or oil-range [or extractable] organics by GC-FID) ( <b>DRO</b> ; recommend C12 to C22; reported as C12 to C16 and C17 to C22) ( <b>ORO</b> ; recommend C23 to C32)	All semi-volatile organics that are extracted from a sample and that are detected by a FID within a certain boiling range (carbon range) and are quantified using a diesel or motor oil standard.	Provides gross concentration of extractable organics within the specified carbon range. Does not provide information about molecular class. Can be used to identify source areas, for mass-fraction calculations of individual compounds, estimating bulk product mobility, or evaluating the extent of organic-impacted	Soil or groundwater (for DRO), soil only (for ORO). Can include non-petroleum extractable organics, (e.g., coal tars, creosote, polar byproducts of biodegradation of

		soil or groundwater. Results should not be used to compare to petroleum hydrocarbon-based cleanup criteria or WQOs. Chromatogram can be used to identify fuel type/weathering.	petroleum, leakage from sewer lines, natural organic matter). Products other than (or in addition to) diesel or motor oil may be present.
<b>8015B DRO/ORO with silica gel cleanup</b> (sgc using a 10-gram column cleanup based on EPA Method 3630C) <b>(DROsgc;</b> recommend C12 to C22; reported as C12 to C16 and C17 to C22) <b>(OROsgc;</b> recommend C23 to C32)	Semi-volatile organics that are non-polar (and therefore are hydrocarbons) and that are detected by a FID within a certain carbon range and are quantified using a diesel or motor oil standard.	Provides the best estimate (if using 8015B) of the gross concentration of hydrocarbons present within the specified carbon range. Therefore results <i>can be used to compare to petroleum hydrocarbon-based cleanup criteria or water quality objectives</i> . Provides some information about molecular type (non-polar), but not aliphatic/aromatic class. Can be used to identify source areas, for mass-fraction calculations of individual constituents, estimating bulk product mobility, or evaluating the extent of petroleum hydrocarbons in soil and groundwater. Chromatogram can be used to identify fuel type/weathering.	Soil or groundwater (for DROsgc), soil only (for OROsgc). Cleanups can be incomplete and should be checked using a reverse surrogate and/or chromatogram pattern. Use of 10-grams of silica gel is advised. Products other than (or in addition to) diesel or motor oil may be present.
Fractionated TPH: Volatile Petroleum Hydrocarbons ( <b>VPH</b> ) (GC-PID/FID; WA DOE method)	Purgeable aliphatic and aromatic hydrocarbons. Separates aliphatics and aromatics by subtracting PID result from FID result. Aliphatics: C5 to C6, >C6 to C8, >C8 to C10, >C10 to C12 Aromatics: C8 to C10, >C10 to C12	Used for gasoline releases. Provides best characterization available of hydrocarbon composition and concentrations. Provides detailed information about molecule class and size; used for quantitative risk assessments and for fate and transport calculations.	Soil or groundwater. Potential to erroneously include aliphatics in the aromatics fraction because of use of a PID to separate aromatics.
Fractionated TPH: Extractable Petroleum Hydrocarbons ( <b>EPH</b> ) (GC-FID; WA DOE method)	Extractable aliphatic and aromatic hydrocarbons. Separates aliphatics and aromatics by fractionation on silica gel column. Aliphatics and aromatics (separately) in the following carbon ranges: >C8 to C10, >C10 to C12, >C12 to C16, >C16 to C21, >C21 to C32	Used for jet fuel, diesel and heavier product releases. Provides best characterization available of hydrocarbon composition and concentrations. Provides detailed information about molecule class and size; used for quantitative risk assessments and for fate and transport calculations.	Soil or groundwater. Fractionation success depends on technician skill.

# **Risk Evaluation**

## **Resources Diverted**

Low-Threat Closure Policy takes on a number of issues the Manual couldn't, so our focus has been on the Policy

CEQA Scoping Meeting:

[http://www.swrcb.ca.gov/water\\_issues/programs/ust/lt\\_cls\\_plcy.shtml](http://www.swrcb.ca.gov/water_issues/programs/ust/lt_cls_plcy.shtml)

Riverside, CA September 28, 2011

Oakland, CA September 29, 2011

# Your Input



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